

# A Reference Model for Software Business Activities

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**Abstract.** Porter's model describing enterprise internal value chain has been applied widely to analysis of operational settings while its' applicability to the domain of software business is limited. This paper presents a model for the core value creating activities for software businesses aiming at explaining the variations of various software businesses and software-based businesses in a compact form. The model is validated by applying it to characterize differences between traditional businesses, independent software vendors, professional service providers, social media platforms, app stores and other related businesses. Most of these follow a main U-shaped value chain from opportunity to offering while differ in customer interface activities and asset management.

**Keywords:** Software business, software-based business, Porter value chain, activity model.

## 1 Introduction

Software industry is a multi-faceted domain where new innovations renew continuously products of software firms, activities they perform and their roles in ecosystems. Segmentation of the software market is continuously changing making it difficult to follow even for industry analysts. For example, estimates for the size of the software industry vary from round 200 B\$ [1] up to 700 B\$ [2] depending if professional IT services is included or not. Similarly, cloud-based business process as a service (BPaaS) market estimates for year 2012 range from 0,8 B\$ [3] to 84 B\$ [4] depending on definition of the segment.

In addition to software firms there exist a variety "software-based businesses" referring to firms classified under other industry codes but having major software development activity and also major impact on the structures of the software industry. For example, Apple is categorized under "electronic computer manufacturing" and "computer and software stores", Google's PSC code R701 refers to "advertising services" and Facebook's NAICS code 519130 is not among the 36 codes related to software rather than refers to "Internet publishing and broadcasting and web search portals". [5] For creating a realistic view of the software industry dynamics we need a means to include these firms in analysis of software businesses.

In this paper we wish to provide a building block enabling systematic discussion on the fuzzy topic using a shared language. For this purpose we propose a reference model for software business activities based on revising Porter's activity approach [6] developed from his value chain approach [7]. Identifying key activities of software

and software-based businesses enables clustering the firms based on their operations and thus creating market segmentations both based on kind of operations and the markets served and using these for various research purposes.

The research question of this paper is, which set of activities enables identification and analysis of value chains of alternative software business and software-based businesses? This problem can be elaborated further by following sub-questions:

1. Which value chains of activities separate different traditional software business models?
2. Which value chains of activities in software businesses differ from other businesses?
3. Which value chains of activities differ between traditional software businesses and cloud business models?
4. Which value chains of activities in software-based businesses differ from traditional software businesses?

This paper applies constructive research approach. Rather than trying to map activities directly against business model canvas or other frameworks[8] we focus on identifying value-creating activities in context of value chains. We first discuss various software businesses and software-based businesses in Chapter 2 setting the scope and requirements for the model to be constructed. Chapter 3 reviews shortly related models and their applicability to satisfy the main research question. Chapter 4 presents the constructed reference model for software business activities. Chapter 5 validates the model by applying it to the sub-questions 1-4 above. In the end we discuss the results, draw the conclusions and open avenues for further research.

## **2 Software Business Domain**

### **2.1 Software Industry in Market Statistics**

Software industry is commonly considered as a part of the ICT industry. While EITO [2] reports telecommunications with 1400 B€ revenue to be the largest market within the 2300B€ ICT industry, their revenue estimates for the IT services and software industry is round 625 B€. Instead, Datamonitor [1] reports software industry to have revenue of 212 B€ but this estimate includes only software product revenues and excludes professional services.

Also the revenue estimates for IT cloud service revenues vary based on the source due to different inclusion and exclusion of businesses. Forrester Research [3] estimates that business process as a service (BPaaS) and software as a service (SaaS) markets for 2012 were 0,8 B\$ and 33,09 B\$ while Gartner [4] estimates the same markets to be 84 B\$ and 14,4 B\$, respectively. It should be noted that Gartner's 84 B\$ BPaaS estimate includes 51 B\$ revenue from advertising services containing mainly Google AddWords revenue. The revenue in platform as a service (PaaS) market an infrastructure as a service (IaaS) market were 1,2 M\$ and 6,2 M\$, respectively. Gartner's estimate[4] for the total public cloud revenues in 2012 added up to total 109 B\$.

## 2.2 Software Businesses and Software-Based Businesses

For the purposes of this paper we divide the software business domain into two main categories, software businesses and software-based businesses. *Software business* refers here to businesses, whose main internal value chain producing most of the revenue includes software development as an essential activity. The business may be operated as a separate legal entity or as a business unit in a large firm. In the previous case it will be categorized officially under software industry while in the later not. *Software-based business* refers here to businesses, whose main revenue source relies on software or software platform developed internally. Google AddWords business is a good example of this category.

Software businesses are traditionally referred to as software products and services industry [9] , which includes categories for packaged mass market software, enterprise solutions, professional software services, and embedded software. Processing services and internet services have been considered as a separate IT market outside the software products and services market. Following the approach of EITO [2] we include IT professional services as a part of the software businesses.

The concept of cloud computing has brought new types of services to the mainstream, where either application, platform and development tools or computing infrastructure is shared among multiple applications using virtualization techniques [10] . These three types of services are referred to as software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS). On contrary to professional IT services implemented by humans and charged by labor time, these services are consumed and paid per-use of the automated service. By shifting the focus from software products to services they also represent a form of the service-dominant logic [11] in the computerized world.

The cloud approach has also shifted our view to software platforms from being operating systems and other products towards being service platforms in the Internet. Salesforce.com is a good example of a SaaS product which evolved into a PaaS platform providing tools for 3<sup>rd</sup> party developers to extend the original application and further, to a marketplace for selling the 3<sup>rd</sup> party applications to other users. In two-sided and multi-sided markets formed round platforms the buyers are attracted by variety of offering and the software or app providers are attracted by number of buyers. However, the full impact of platforms is still to be studied [12] .

Proprietary specialized cloud platforms provide a good infrastructure for content distribution, but especially for app stores and social media platforms utilizing the two-sided market approach. Several high-tech firms make intensively use of software developed in-house although they are not classified as software. For example, Apple, Google and Facebook would not possess their current market position and capitalization without software in the hart of the company. However, none of them makes their main revenue by selling software or software development related services rather than use software as the platform for their businesses. For Google and Facebook the advertising revenues dominating the revenue are based on user-created content on the proprietary software platform. 87% of Google revenue came from advertising services in 2012 [13] . For Apple the main revenue sources are sales of various devices and App Store business selling syndicated media content and 3<sup>rd</sup> party applications. Out of these we categorize the App Store business clearly as a

software-based business while the role of other software development integrated to device business is arguable. Also social media platforms like Facebook enabling sharing of user-created content are included in the software-based businesses in this paper.

### **3 Related Models**

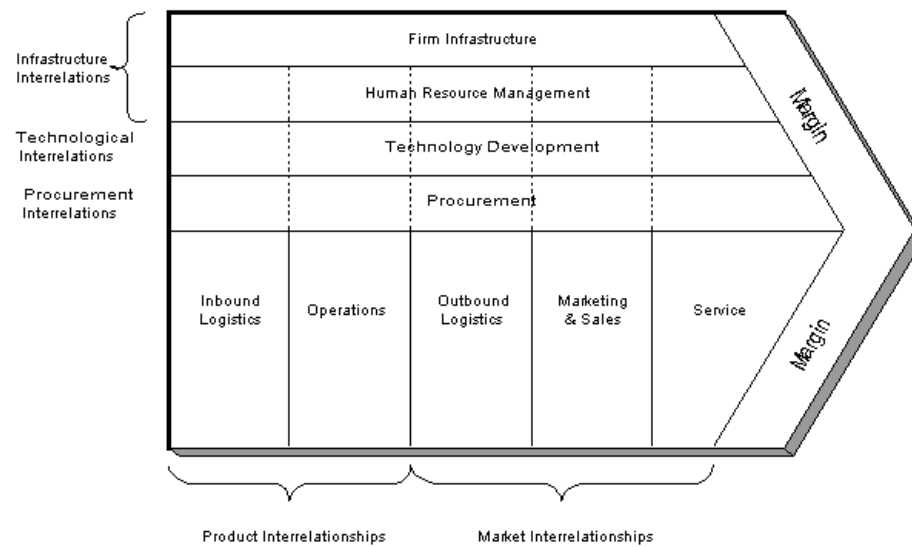
Porter's value chain has been one of the most famous models for an overall description of company's value chain activities. In addition to Porter's model this Chapter reviews shortly other models potentially applicable for presenting software firm's internal activities as well as positioning software firm in a business context.

#### **3.1 Porter's Value Chain**

Porter and Millar [7] provide a framework for analyzing the strategic significance of the new information technology on how the companies operate internally as well as the relationship among companies and their suppliers, customers and rivals. They divide company's activities into the technologically and economically distinct activities it performs to do business, called "value activities". They divide company's value activities into nine generic categories presented in Fig 1.

Primary activities are involved in the physical creation of the product, its marketing and delivery to buyers, and its support and servicing after sale. The primary activities are presented visually as a chain from the inbound logistics on the left through the central activity of production and outbound logistics towards the immediate customer on the right. Support activities provide the inputs and infrastructure that allow the primary activities to take place. When cost of all activities is summed up, it should be less than the value captured from the immediate customers, providing the margin (represented on the right hand side in Fig 1). A company's value chain is a system of interdependent activities. Linkages between activities represent impact of the first activity to the cost of the dependent activity. Thus optimizing one activity locally may increase costs of the dependent activity reducing the total margin. [7]

The value chain for a company is embedded in a larger stream of activities referred to as "value system". The company's product often passes through its channels' value chains on its way to the ultimate buyer. The competitive position of the company will be changed as the information technology changes the industry structure, value system and rules of competition. But it also enables companies to outperform rivals by new ways and can open whole new businesses, often from within company's existing operations. [7] The essence in competitive strategy is about being different. It means deliberately choosing a different set of activities to deliver a unique mix of value. Later Porter uses also activity-system maps for visualizing the activities and their relations to show a company's strategic position is contained in a set of tailored activities to deliver it. [6]



**Fig. 1.** The value chain of a company (revised from [7]) presents the main value activities. The primary activities on the bottom present a sequence from the upstream to downstream, from inbound logistics to services. The support activities are listed on the top.

From the perspective of software business activities Porter's value chain model is a poor fit. There is rather little emphasis on inbound logistics and operations in software product firms due to immaterial nature of software while the core activity of a software firm, software development, is embedded within technology development.

## 2.2 Internal Models

During the relatively short history of information technology a variety of models has been created for managing software activity within software producing firms and firms deploying software. The common means to abstract software activity in software firms has been software processes models, such as CMM, CMMI and SPICE while also specialized reference models exist for e.g. product management [14]. Software utilizing firms have used models focusing on IT services, such as ITIL and Cobit or emphasized IT business alignment in form of an enterprise architecture [15].

Capability Maturity Model (CMM [16]) was developed to help software development organizations in their internal process improvement activity. It includes general description of the main processes in software development activity as well as related management and organizational processes. While the original CMM was somewhat limited, the development of a more flexible SPICE model reached acceptance and gained status of an ISO standard. SPICE (Software Process Improvement and Capability Determination, ISO/IEC 15504 [17]) is a reference model for the maturity models for process assessment purposes of software firms. The reference model of SPICE includes also processes related to customer-supplier

interaction and engineering the business, but rather than enforcing a specific process structure in the assessment it enables flexibility in the scope of the assessment.

On the IT utilizing side the IT Infrastructure Library (ITIL, ISO/IEC 20000 [18] ) framework is one of the most widely adopted approaches to IT service management. It breaks down the key principle of the IT service management discipline into categories for the planning to implement service management, business perspective, service management containing service support and delivery, ICT infrastructure management, security management and application management. Control Objectives for Information and Related Technology (COBIT [19]) is a framework for IT management and governance. It is a supporting toolset that allows managers to bridge the gap between control requirements, technical issues and business risks and is often used in conjunction with ITIL. CMMI is a further developed version of CMM and it has adopted features both from SPICE and from ITIL and presents standard processes both for development [20] and for services [21] .

These internal models tend to elaborate internal activity to a high granularity level distracting focus on core activities of software businesses and still exclude activities needed for describing value creation of some categories of firms presented in the previous sections, such as opportunity detection, cloud capacity and content acquisition or app delivery. Next we shall look at the models emphasizing the external interface of the firm.

## **2.2 External Models**

There are various models on business networks, ecosystems and industry structures, which can be used in analyzing software businesses from the external viewpoint. Messerschmitt and Szyperski [22] presented a model for the natural partitioning of a IT value chain, where application software supplier and infrastructure software supplier products are integrated by a system integrator, whose outputs are operated by infrastructure service provider (ISP) and application service provider (ASP) serving the end-user organization. This model was further elaborated by Warsta and Seppänen [23] in their software value network framework by adding roles of business consultant and industry consultant bringing in other stakeholders of the industry which together form ecosystem of firms in the same value system. These ecosystems [24] are often centered round platforms [12] providing two or multisided markets where application and content providers meet the users.

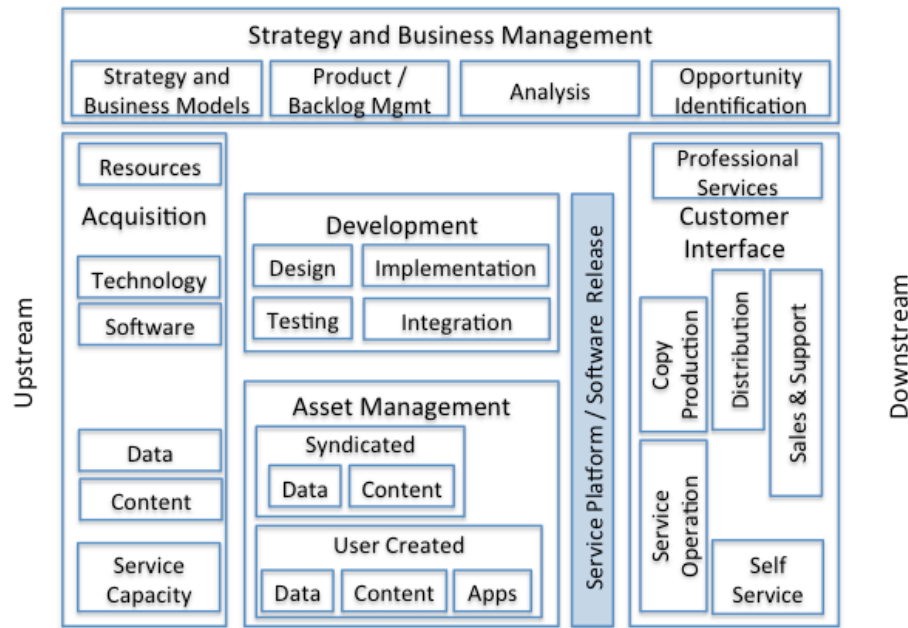
As mentioned earlier, these external models are valuable in positioning a firm in the business context while they do not address the internal activities of a firm.

## **4 A Reference Model for Software Business Activities**

This chapter presents a first attempt to form a model containing the essential activities relevant while analyzing internal value chains of software businesses and software-based businesses, their similarities and differences. The activities chosen to the model can either be present in the various business models or they may be excluded. In

addition, there are multiple inherently different ways to perform some of the activities having major impact on the firm performance.

The model is presented in visual form in Fig 2. It contains activities represented as boxes. The large boxes containing other boxes are main activities containing sub activities. The main activities can also be referred to as activity areas clustering together interrelated sets of sub-activities. The visual positioning of the main activities follows flow from upstream vendors (on the left) to downstream direct customers (on the right). The sub-activities are positioned randomly within the main activities.



**Fig. 2.** The proposed model for software business activities. The five main activities are presented as boxes containing sub-activities round the “Service platform / Software release” element defining the domain.

In addition to activities the model contains one special element entitled “*Software Release / Service Platform*” representing the characteristic component of what is considered here as a software business or a software-based business. The activities round it are described next following the clustering.

**Software Development.** Software development includes activities needed form producing the software release or service platform based on the requirements or backlog provided. The main activities here are design, development, integration, and testing. In agile development processes these activities are iterated in a 2-4 weeks cycle while in waterfall model the organization follows merely sequential path with multiple testing phases.

**Strategy and Business Management.** Strategy and business management activities translate market opportunity (opportunity discovery [25]) and technological opportunity (opportunity creation) into requirements or backlog needed for guiding the software development. This includes analysis of user feed-back, user needs, market position and networks, required technology, competences and matching them with the resources, strategy and business model of the firm. Product management supervising the requirement / backlog management activities guides the development and directs the acquisition of necessary human resources, competences and assets. The strategy and business models activity revise the strategy and business models based on the analysis data, guides renewal of the delivery activities in a managerial level and renews strategic relationships with other firms.

**Acquisition.** Acquisition activities include renewal of the software and technology base-line used for development activity, relationship management for content, data and infrastructure service providers (IaaS, PaaS) as well as activities related to acquiring new competences and competent human resources.

**Customer interface.** Customer interface activities form the interface to deliver software, software-based services and professional IT services to the direct downstream customer as well as to respond to in-bound operational requests and feed-back from the customer. It includes sales activities, copy production from software releases, distributing them to direct customers on a physical media or via networks and support activities. The direct customer may also be another business unit of the same firm embedding the software release into hardware or operating the service platform release. Also providing programming service and consulting services through professional service activity is included. The customer interface activities related to social media platforms and app stores include service operation and inbound self-service activities.

**Asset management.** Asset management activities are clustered under two intermediate groups for syndicated assets and for user created assets. The activities for managing syndicated assets are involved when 3<sup>rd</sup> party media or other content coming into the firm through the upstream acquisition activity is managed and provided as a part of a software release (e.g. in games) or on a service platform as a service. Open data and other data provided by upstream 3<sup>rd</sup> parties can also be included in software releases or as a service.

Asset management activities for user created content includes data and content stored by social media and service platform users. In addition, a platform providing an opportunity for 3<sup>rd</sup> party users to create or upload applications for sharing with others or for re-sales takes place as an asset management activity.

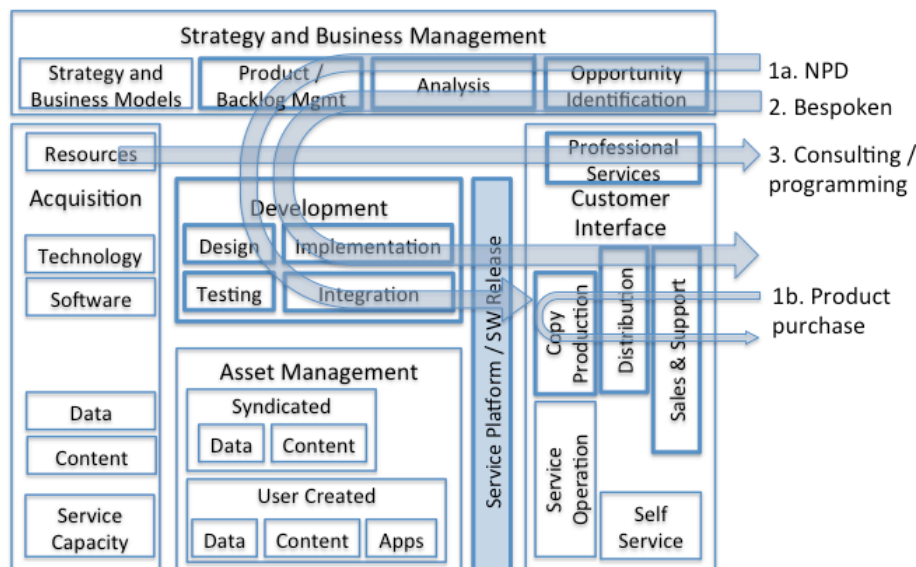


## 5 Validating the Model

This chapter validates the proposed model by applying it to sub-questions 1-4. The model is assumed to be valid if it is able to provide sufficient answers for the questions.

### 2.1 Comparing Traditional Software Businesses

Company internal value networks for traditional software business models are outlined in Fig 3 with simplified value chains. The main activities involved are highlighted with thick borderlines.



**Fig. 3.** Comparing value chains within traditional software business operations. 1a presents the main value chain when developing a new software product. 1 b presents activities related to software product purchase. Value chain 2 presents software developed for matching user need. Value chain 3 presents activities related to professional services.

Value chain 1 a represents the main activities related to development of a new software product. The process starts with opportunity identification including customer need and market data collection. The product functionality and target market are scoped in the analysis followed by translating the results to form of a backlog or requirements for the development. The software development activity produces a software release provided for the customer interface. Value chain 1 b makes use of the release by selling the software product, making product copies and distributing them to the customers.

Value chain 2 represents similar chain of activities needed for satisfying a need of a customer ordering software developed for their specific need. In this case the

opportunity identification is limited to identifying potential large customers and the analysis is limited to analysis of the needs of this specific customer. Backlog management and development are mainly similar to the activities in value chain 1. In the customer interface only one software release is created with no need to copy and distribute the software to several customers.

Value chain 3 represents consulting, where the software business provides competent professional resources for the use of a customer organization. There are variations in the details of the activities depending on the nature of the assignment varying from business process consulting and system analysis and design to implementation and testing tasks. In case we would define “software business” as “a business producing software releases” this short value chain would be excluded from our scope, but with the current definition it is included.

## 2.2 Traditional Software Businesses vs. Other Traditional Businesses

If we assume the structure of Porter’s value chain of a company in Fig 1 to represent typical traditional businesses we can compare them with typical traditional software businesses by comparing Fig 1 and Fig 3. We can compare the key activities, the main value chains and their relation to the upstream / downstream axis with Table 1.

**Table 1.** Comparison of a typical software product business and a typical value chain in the Porter’s model.

	Software product business	Porter’s value chain
Core activity	Software Development	Operations
Value chain start and end	Opportunity Identification -> Software Offering	Inbound Logistics -> Services
Up/downstream direction	Downstream -> Downstream	Upstream -> Downstream

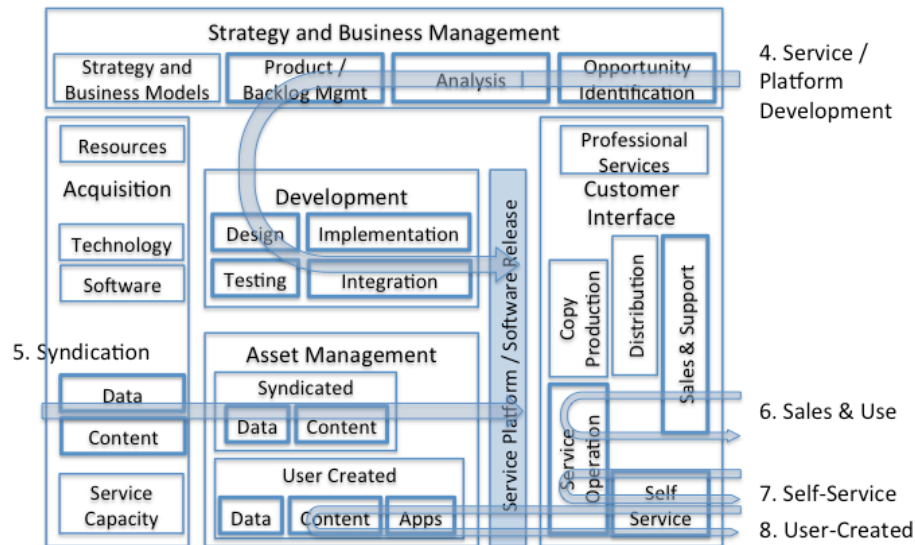
Porter’s main value chain of primary activities starts from inbound logistics and follows the flow of materials through core activity of operations to sales and services. In traditional production-oriented businesses this is the material flow where decisions made in the previous activity will mostly affect the cost of the following activity. In the software product business main value chain we follow the contemporary lean [26] approach where value chain represents the sequence of activities adding value for the customers and other stakeholders, following the lean principles. This value chain starts from opportunity identification and proceeds through core activity of software development to new product offering. Compared to the upstream – downstream direction the Porter’s value chain follows the stream of materials while the value chain of software product business makes a U-turn, from opportunity to offering. Both the Porter’s model and the Software business activity model include short cycle from order to delivery, which can be optimized as a part of operational excellence. However, the main value chains and the core activities are essentially different.

## 2.3 Traditional Software Businesses vs. Cloud Businesses Models

The software product business value chain for new product development (1a in Fig 3) corresponds well with the main value chain for SaaS development (4 in Fig 4). However, there is a major difference in software product purchase (1b) and the delivery of SaaS service to the customer in the activity area of customer interface. Instead of copy production and distribution the SaaS business models use service platform and service operation as the activities to deliver the service. Depending on the sales model the SaaS may use self-service (7 in Fig 4), channel partners or salesmen (6 in Fig 4) [27] much the same way software product sales activities take place. Other cloud service businesses are not elaborated here due to space limitations.

## 2.4 Software Businesses vs. Software-Based Businesses

The software-based businesses add a set of activities related to asset management to the value chains while they follow mainly the SaaS business value chain. Also social media platforms, content distribution an app stores base their operation on platform software development value chain similar to SaaS or PaaS platform development (4 in Fig 4). They add two main flows of value creation through bringing in the content either from the publishers (5 in Fig 4) or from the users and provider-side customers in two-sided markets (8 in Fig 4).



**Fig. 4.** Major value chains related to cloud and social media services.

## 6 Summary and Conclusions

Software industry is a multi-faceted domain where innovations renew continuously products of software firms, activities they perform and their roles in ecosystems. In addition to software firms there exist a variety “software-based businesses” referring to firms classified under other industry codes but having major software development activity and major impact on the structures of the software industry. In this paper we propose a reference model for software business activities based on Porter’s seminal work on activities and value chains. We identify key activities of software and software-based businesses and present them as a activity map for market segmentation and research purposes. The proposed model is evaluated by presenting key differences of traditional software businesses and software-based businesses.

Porter’s value chain connections between activities represent impact of the first activity to the cost of the dependent activity [7]. This is useful for cost-optimization of production-intensive businesses and creates typically a value chain following flow of materials from the upstream vendors to the downstream customers. In the proposed software business activity model the value chains connect the activities adding value [26] for customers and stakeholders. Both in software businesses and software-based businesses this creates a common U-shaped value chain starting from opportunity identification based on a down-stream customer need and going through software development activity to the software release / service platform.

Among software businesses and software-based businesses there are two main areas where activities differ after the common U-shape. First, the traditional software businesses rely on copy production while cloud-based and social media approaches use mainly a service platform for customer interaction. Secondly, social media, app stores and media distribution all add asset management activity as an activity area mostly missing both from traditional software businesses and basic SaaS offerings.

The role of professional IT services as a part of software business does not get support from this activity analysis. Further elaboration is also needed for the activities in PaaS and IaaS businesses, in software utilizing firms and in case of a software business unit providing embedded software for another business unit of a firm.

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